

This file contains an explanation of the variables used in the raw and processed data files in support of the manuscript titled “Enhanced rock weathering altered soil organic carbon fluxes in a plant trial” by Boito et al. (2025). File names are in **bold**, while column names in *italics*.

Throughout the data files, the column *Pot* refers to the ID of an individual mesocosm, as data was collected individually for each mesocosm. *Days_start* or *Daysafterstart* refer to the number of days after basalt amendment. Columns *Corn*, *Basalt*, *Worms* are binary variables, with Yes or 1 if Plants/Basalt/Earthworms are present, and a No or a 0 if they are not present.

Treatment codes used throughout the experiment:

Treatment code	Meaning	Correspondence in the manuscript
S	Unplanted control	U
SB	Unplanted Basalt	UB
C	Planted control	P
BC	Planted Basalt	PB
CW	Planted + Earthworms control	PE
BCW	Planted + Earthworms Basalt	PEB

Data architecture

R1_Aboveground_biomass.csv and **R2_Belowground_biomass.csv** files contain data on above- and below-ground biomass. **P2_Belowground_Biomass_Modelled.csv** contains an estimation of belowground biomass. **R3_Earthworm_casts_raw.csv** file contains data on earthworm casts.

R6_Soil_pH_raw.csv contains data on soil pH. Soil water content, soil temperature and electrical conductivity for the first growing season, the fallow period and the second growing season measured by sensors every five minutes are contained in the **R7_ .dat files**. The daily averages for each mesocosm calculated from the sensor data collected every five minutes are presented in the **P7_EC_SWC_T_daily_processed.csv** file.

Soil CO₂ efflux (SCE) data, collected with EGM and PICARRO instruments, are present in the **R4_EGM_data_raw.xlsx** and **R5_PICARRO_data_raw.xlsx** respectively.

Normalized SCE data obtained from EGM measurements (EGM_n) for the first growing season, fallow period and second growing season is presented in the files **P4.1_EGM_n_Residuals_First_Growing_Season.csv**, **P4.2_EGM_n_Residuals_Fallow_Period.csv** and **P4.3_EGM_n_Residuals_Second_Growing_Season.csv** respectively.

R5_PICARRO_data_raw.xlsx contains data for every second on the CO₂ concentrations (¹²CO₂ and ¹³CO₂) and their $\delta^{13}\text{C}$.

The $\delta^{13}\text{C}_{\text{SCE}}$ estimated after Keeling (1958) is presented in the file **P5.1_Delta13C_picarro_processed.csv**. Based on $\delta^{13}\text{C}_{\text{SCE}}$, F_{rhizo} and F_{SOM} were estimated using three distinct approaches, which use different $\delta^{13}\text{C}_{\text{SOM}}$. These three approaches and their resulting F_{rhizo} , F_{SOM} , R_{rhizo} and R_{SOM} are presented in files **P5.2.0_SCE_PICARRO_Partitioned_MovingUnplantedBasalt.xlsx**,

P5.3.0_SCE_PICARRO_Partitioned_MovingUnplantedControl.xlsx,
P5.4.0_SCE_PICARRO_Partitioned_Vienna.xlsx.

and

After normalization of the R_{rhizo} and R_{SOM} obtained with the three different partitioning approaches, residuals are presented separately for each partitioning approach files denoted as **P5.2.2**, **P5.3.2**, and **P5.4.2** (three files on R_{rhizo_n} , one for each partitioning, each containing two tabs with the growing seasons) and **P5.2.1**, **P5.3.1**, **P5.4.1**, **P5.5** (four files on R_{SOM_n} : one for each partitioning, each containing two tabs with the growing seasons; and an additional file with unpartitioned $SCE_{PICARRO_n}$ flux, with data collected during the fallow period in absence of plants.

Raw data files

R1_Aboveground_biomass.csv: *Biomass_g* is the total aboveground biomass in grams for each mesocosm.

R2_Belowground_biomass.csv: *Weight_g* is the dry weight in grams of the roots. *Depth* is the depth of sampling, either 0-20cm, 20-40cm or 40-60cm. *Type* is the type of sample, whether it was taken right below the corn stub (plant) or in the middle of the mesocosm (mid).

R3_Earthworm_casts_raw.csv: *Weight_g* is the dry weight of the earthworm casts collected every week in grams.

R4_EGM_data_raw.xlsx:

- First growing season tab: *DeltaCO2* is final CO_2 concentration – initial CO_2 concentration (ppm), during the 120 seconds of measurement. *SoilT* is soil temperature ($^{\circ}C$) and *SWC_corrected* is soil water content expressed at % of water holding capacity, at the time of measurement. The *DeltaCO2* in ppm is then transformed into $\mu mol\ CO_2\ m^{-2}\ s^{-1}$ in column *micromolCO2_m2_s* using the ideal gas law $n = (p * V)/(RT)$, where V = volume of gas in m^3 , obtained by multiplying the increase in ppm/s by the volume of the chamber ($0.9\ dm^3$); p = pressure (101325 Pa); R = gas constant, $8.314\ J/mol * K$; T = temperature (K). *SCE* is the base 10 log of *micromolCO2_m2_s* + 1.
- Second growing season tab: *micromolCO2_m2_s1* is *micromolCO2_m2_s* + 1, and *SCE* its base 10 logarithm
- Fallow period tab: *CO2flux_ppm_s* is the *DeltaCO2* divided by 120 seconds ($ppm\ s^{-1}$). V = volume in m^3 , as explained above.

R5_PICARRO_data_raw.xlsx:

X12CO2_dry = $^{12}CO_2$ concentration (ppm); *X13CO2_dry* = $^{13}CO_2$ concentration (ppm); *Delta_Raw* = $\delta^{13}C$ signature of the efflux (‰); *Custom* = time; *Seconds* = incremental seconds that the measurement lasted, for each mesocosm.

R6_Soil_pH_raw.csv: column *pH* is the measured soil pH.

R7.1 through R7.3 .dat files: contain data every five minutes on volumetric water content (*VWC*; absolute, not as % of water holding capacity; $m^3\ water\ m^{-3}\ soil$), electrical conductivity (*EC*; $dS\ m^{-1}$), temperature (*T*, $^{\circ}C$).

Processed data files

P2_Belowground_Biomass_Modelled.csv: *total_biomass_g* = modelled belowground biomass in g; *Season* = either first or second growing season.

P4.1_EGM_n_Residuals_First_Growing_Season.csv;

P4.2_EGM_n_Residuals_Fallow_Period.csv

P4.3_EGM_n_Residuals_Second_Growing_Season.csv;

P5.2.1_RSOM_n_MovingUnplantedBasalt.xlsx;

P5.2.2_Rrhizo_n_MovingUnplantedBasalt.xlsx;

P5.3.1_RSOM_n_MovingUnplantedControl.xlsx;

P5.3.2_Rrhizo_n_MovingUnplantedControl.xlsx;

P5.4.1_RSOM_n_Vienna.xlsx;

P5.4.2_Rrhizo_n_Vienna.xlsx

P5.5_RSOM_n_Fallow_Period_NotPartitioned.csv: *Residuals* = residuals of the normalization models performed on SCE, in $\log_{10}(\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1} + 1)$.

P5.1_Delta13C_picarro_processed.csv: *Time* = hh:mm at which the measurement started; *Duration_s* = duration of the measurement (seconds); *CO2_slope* = slope of increase in CO₂ emissions (ppm s⁻¹); *Keeling_slope* = slope of the Keeling plots, (‰ ppm); *Delta_interc* = intercept of the Keeling plot, (‰); *se_interc* = standard error on the intercept (‰); *CI_lower* and *CI_higher* = 95% confidence intervals on the intercept (‰); *R2* = R-squared of the Keeling plot, (0-1); *totalCO2_start* = *X12CO2_dry* + *X13CO2_dry* at the start of the measurement (ppm); *totalCO2_end* = *X12CO2_dry* + *X13CO2_dry* at the end of the measurement (ppm); *flux_ppm* = *totalCO2_end* – *totalCO2_start* (ppm).

P5.2.0_SCE_PICARRO_Partitioned_MovingUnplantedBasalt.csv: *micromolCO2_m2_s* = as in **R4_EGM_data_raw.xls**; *avg_Delta_interc* = average of the *Delta_interc* for each measuring day, for the Unplanted Basalt treatment (‰); *frhizo* = fraction of SCE due to rhizosphere respiration (0-1); *fSOM* = fraction of SCE due to SOM decomposition (0-1); *RSOM* = SCE due to SOM decomposition, obtained by multiplying *fSOM* by *micromolCO2_m2_s* ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$); *Rrhizo* = SCE due to rhizosphere respiration, obtained by multiplying *frhizo* by *micromolCO2_m2_s* ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$).

P5.3.0_SCE_PICARRO_Partitioned_MovingUnplantedControl.csv: *avg_Delta_interc* = average of the *Delta_interc* for each measuring day, for the Unplanted control treatment (‰); the remaining columns are the same as in **P5.2.0** file.

P5.4.0_SCE_PICARRO_Partitioned_Vienna.csv: *frhizo* and *fSOM* are calculated using the $\delta^{13}\text{C}$ signature of soil as measured by elemental analyser coupled to an isotope ratio mass spectrometer and then corrected for diffusion fractionation. The remaining columns are the same as in **P5.2.0** and **P5.3.0** and files.

P7_EC_SWC_T_daily_processed.csv: *avg_VWC_pot* = average volumetric water content for a mesocosm over a day ($\text{m}^3 \text{ water m}^{-3} \text{ soil}$); *se_VWC_pot* = standard error on the mean; *avg_EC_pot* = average electrical conductivity for a mesocosm over a day (dS m^{-1}); *se_EC_pot* = standard error on the mean; *avg_T_pot* = average soil temperature for a mesocosm over a day (°C); *se_T_pot* = standard error on the mean; *SWC_max* = water holding capacity ($\text{m}^3 \text{ water m}^{-3} \text{ soil}$); *SWC_corr_pot* = SWC expressed as fraction of water holding capacity calculated by dividing VWC by *SWC_max*; *se_SWC_pot* = standard error on the mean.